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(19)

(54) CUSHION LAMINATE

(71) We, MINNESOTA MINING AND MANUFACTURING COMPANY, a corporation organised and existing under the Laws of the State of Delaware, United States of America, of 2501 Hudson Road, Saint Paul, Minnesota 55101, United States of America, do hereby declare that the invention, for which we pray that a Patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

According to the present invention there is provided a cushion laminate which is suitable for use as a saddle pad and comprises a layer of a cushioning material bonded to an absorbent material. More particularly, the present invention relates to an absorbent cushion comprising a flexible, resilient, nonabsorbent mat material removably and adhesively bonded to a fibrous absorbent material surfaced with a smooth, porous, self-sustaining thermoplastic film, moisture being absorbed through holes in the thermoplastic film and into the fibrous web, while the matt provides a cushioning effect between, for example, a saddle and a horse.

Saddle blankets or pads are used quite extensively at the present time for the protection of horses when saddles or harnesses are used. The blanket is intended to provide a cushioning effect between the horse and the saddle or harness and to absorb "sweat" or other secretions eminating from the horse so that irritations or sores will not form on the horses' back. At the present time saddle blankets are made from various fabrics which have several disadvantages. First, with repeated use, the blanket or pad continually loses its ability to absorb moisture or other secretions and to provide a cushioning effect as dirt, hair, oils, etc. tend to accumulate in the matrix of the blanket. This loss of cushioning and absorption commonly results in pressure sores, fungus growths, blistering, etc. caused by excess pressure, moisture and heat on the horse. Once the prior art blanket becomes saturated, as described, it is very difficult to clean or dry it out. Also, the blanket, due to the fabric nature thereof, has a tendency to back-comb or rub the horses hair against the direction it normally lies, providing additional discomfort to the horse.

There have been attempts to provide saddle blankets to obviate the above problems. According to the prior art, a horse blanket is provided which comprises an absorbent paper layer bonded to an impermeable plastic layer, the entire blanket being disposable after a single use. This type of horse blanket aids in the absorption of sweat but provides no cushioning effect for the saddle. Even then, paper has a tendency to mat and the imperviousness of the plastic backing has limited absorbency. The plastic sheet is only used to prevent the sweat from the horse from transferring through the blanket and soiling or otherwise ruining the saddle and provides no cushioning effect. At the present time, the applicant is unaware of any type of saddle pad or blanket which provides a good mechanical cushioning effect between the horse and the saddle and further provides for absorption of sweat and other secretions and, consequently, reduces or eliminates sores of various microbial growths on the horses back, aiding in the comfort of the horse and also reducing the amount of medical attention needed to cure such afflictions.

According to the present invention, there is provided a flexible, resilient, absorbent

cushion laminate comprising a generally flat sheet of a cushioning material bonded to a generally flat, absorbent sheet of material capable of absorbing moisture or other secretions and comprising a fibrous backing material surfaced with a self-sustaining, porous, thermoplastic film facing, the porosity of such facing being provided by a plurality of holes through said facing, the fibrous backing having fibres thereof embedded on the facing substantially throughout the area of contact of the backing and the facing thus uniting the backing and facing to one another, and the cushioning material being bonded to the fibrous backing portion of the absorbent sheet. The film facing is the portion of the cushion that contacts the hide of the horse, or the like, secretions being absorbed therethrough. The absorbent layer is removable and disposable and may be replaced by a new absorbent layer to insure that the absorption of secretions will not be hindered. Preferably, the cushioning material is nonabsorbent and the absorbent layer is adhesively, removably bonded to the cushioning material so that the absorbent layer can be removed.

The nonabsorbent cushioning material is preferably a mat of interengaged, crinkled filaments of resilient thermoplastic polymeric material united together at points of mutual contact to form a flexible, resilient, integrated structure the inner portion of which has been treated to form a substantially flattened surface and produce a higher concentration of filament than in the outer portion of the mat.

The advantages and features of the present invention will be best understood the following example with reference to the accompanying drawing wherein:

Figure 1 is a perspective view of a saddle pad as taught by the present invention;

Figure 2 is a partial cut away of the saddle pad illustrated in Figure 1; and

Figure 3 is an enlarged detailed view of the pad of Figure 1 illustrating the three-dimensional arrangement of filaments in the cushioning portion of the laminate, and the fibrous attachment to the thermoplastic film of the absorbent portion of the laminate.

With reference to Figure 1, the flexible, resilient, absorbent cushion laminate 10 of the present invention comprises, essentially, a cushioning layer 12 bonded to an absorbent layer 14 by means of an adhesive (not shown). The adhesive preferably is sufficient to hold the cushioning layer and the absorbent layer together but yet allow them to be separated so that the absorbent layer may be discarded after saturation with dirt, oil, hair, etc., and replaced by a new absorbent layer. If desired, to further facilitate the removal of the absorbent layer, a light reinforcing scrim (e.g., layer of light reinforcing fabric) may be added to the absorbent layer with the adhesive.

The illustrations in Figures 2 and 3 more clearly show the preferred embodiment of the present invention. The absorbent cushion laminate 10 is a composite of an open mat 12 of interengaged, crinkled filaments 22 of a resiliently thermoplastic, polymeric material united together at points of mutual contact to form a flexible resilient integrated structure the inner portion of which has been treated to form a substantially flattened surface and produce a higher concentration of filament than in the outer portion of the mat; and an absorbent material 14 comprising a fibrous backing material 20 surfaced with a thin, self-sustaining, highly porous, nonabsorbent smooth thermoplastic film facing 18. The two layers are removably and adhesively bonded together with an adhesive 16, preferably with an acrylate adhesive, as acrylate adhesives are generally inexpensive, non-toxic, and stable. Although it is preferred that the absorbent layer be removable from the laminate so that it might be replaced, it is within the scope of this invention to have the absorbent layer permanently bonded to the cushion layer.

The mat or cushioning portion 12 of the cushion laminate is prepared by extruding a molten polymer in the form of a bundle of free-flowing thick filaments which progresses downwardly into glancing contact with a contact surface of a smooth plate or roll and into a quench bath. The contact surface is maintained just above the surface of the quench bath so that filaments making glancing contact with it will thereafter fall into the quench bath. The filament bundle is aligned to permit some of the outer filaments to make such contact with the contacting surface and the remaining filament in the bundle to fall directly into the quench bath, thereby providing differential quenching which imparts unique structural properties to the cushion. The web is advanced at a slower rate than the contact surface causing the quenched portion of the bundle to continuously support the incoming portion. As a result, there is produced a filamentous web having a flattened surface and a highly expanded lofty open structure.

The amount of bonding or spot welding occurring during the process just described may be adjusted by changes in the particular polymer employed, the temperature of the filament at point of contact, the diameter of the filament, the rate of withdrawal of the mat, and in other ways.

As illustrated in Figure 3, the concentration of the filaments in the lower portion 26 of the section as shown is considerably greater than in the upper portion 28. The filaments are crinkled and interengaged to provide a crush-resistant, resilient mat having substantial integrity. Adjacent surfaces of the interengaged filaments are effectively bonded during the process to produce a mat surface of high structural stability and integrity.

The width and thickness of the mat which may be produced can be varied. For example, a typical mat may contain a total of 260 filaments and have a width of 8 inches (20 cm.) and a thickness of 1/2 inch (1.25 cm.). However, it is found that the edges or faces of such web may be joined together to produce webs of any desired width, particularly that necessary for use as a saddle pad. The laterally extending coils and loops of the filaments along the adjacent surfaces intermesh sufficiently to produce an effective bond when further treated with minimal quantities of hardenable liquid adhesive.

The flattened or lower surface 26 contains a higher concentration or density of filament than does the remainder of the structure, and presents a greater contact area than does the opposite unflattened surface 28. As a result, adhesives are enabled to form a strong bond with the flat surfaces. Various polymeric materials may be used to form the mat, such as polycarbonate, polyolefin polyester, vinyl polymer, polyamide, ionomer, and other resins which are extrudable at elevated temperatures in the form of soft, flexible, continuous filaments and which at lower temperatures have the required stiffness, toughness and other required physical and chemical characteristics to permit cohesion of the filaments. Particular polymers may, if desired, contain plasticizers or softeners and may be otherwise modified by the addition of coloring agents, fibrous or nonfibrous reinforcing agents, stabilizers, fillers and other additives.

If desired, the mat portion of the laminate may be modified for asthetic or other reasons. Examples of this are treatment with solutions or suspensions of resins, bonding agents or coating agents, dyeing or metallizing the filaments, further addition of particulate materials such as metal flakes, fibrous flock, ground cork or the like, or embossing, skiving, shearing, laminating, partial fusing or other physical treatment.

Although filaments of very small as well as very large diameter may be produced, products containing filaments within the range 5 mils to 125 mils, more preferably 15 to 35 mils, in diameter, provide a high degree of resilience and crush resistance together with excellent mechanical strength and are preferred for use as a saddle pad. Smaller and larger filaments behave similarly in many respects and may be used if desired, the diameters of less than substantially 5 mils are difficult to prepare by the extrusion methods described herein.

Although the filamentous mat structure is generally preferred in the construction of the cushion laminate of the invention, other cushioning materials may be used. Examples of such materials are low density nylon web, polyurethane foam, or suitable fabrics, the absorbent layer disclosed herein obviating the problems of the prior art fabric saddle pads or blankets.

The absorbent material, which preferably has a thickness of substantially 1/8 inch, usable for purposes of the invention combines an absorbent backing material with a breathable, inert layer or film, the outer surface of the film being smooth and porous, substantially throughout its area yet nonadherent to skin or horse hide. The film should be smooth but not slippery so that the pad can move somewhat over the horse hair to prevent backcombing, but yet not slide out from under the saddle. The degree of smoothness tolerable can only be determined through observation. The conformability of the mat portion or the whole laminate also plays a role in the unique ability of the pad to stay in place.

The absorbent material 14 comprises a fibrous web 20 bonded to a thermoplastic film 18. The absorbent webs 20 can comprise any acceptable absorbent materials, e.g., cotton, rayon, cellulosic batts, etc., which are commonly used for such purposes. However, preferred absorbent materials are fibrous batts, wadding, or the like, of fibers which can be readily bonded by known techniques, such as needling, felting, and other techniques known in the art. The preferred absorbent material is rayon in the form of fibers having a denier in the range of 1.5 to 6.0 and having a web weight in the range of 30 to 100 pounds (0.68 to 45 kg.) per 320 square yards. The length of the fibers is preferably in the range of 1 to 3 inches (2.5 to 7.6 cm.).

The thermoplastic film 18 is preferably a soft, flexible, thin, nonabsorbent, highly porous, self-sustaining, film of inert polyethylene of no greater than substantially 1 mil in thickness and having an outer smooth-feeling, skin-like surface. The thermoplastic film is porous to allow the transfer of moisture, etc. therethrough to the absorbent backing. The holes 24 or pores may be of any size or diameter as long as a suitable amount of the smooth thermoplastisc film is available for contact with the hide. The size of the hole which need not be circular, is preferably no greater than substantially 1/10 to 1/8 inch (0.25 to 0.30 cm.). More preferably, the film contains an average of substantially 10 to 40 pores or holes per square millimeter of surface, the holes being roughly rectangular or oblong and ranging in length from substantially 15 to substantially 220 microns and larger and in width up to substantially 75 microns. The average hole size is no larger, and usually much smaller than 0.01 square millimeter, e.g. 0.005 square millimeter and smaller. Overall, substantially 10 to 40%, preferably 20 to 30%, of the surface area of the film is comprised of the openings.

The absorbent layer can be prepared by heat bonding a thin layer (substantially 3/4 mil thick) of polyethylene to a layer of rayon

fibers at a temperature of about 350°F. (176°C.) under a nip pressure of about 70 pounds (28 kg.) w.g. When this is done, the fibrous web backing is in close proximity to the thermoplastic film, and many of the fibers are bonded to the thermoplastic film as illustrated in Figure 3. The heating bonding of the polyethylene to the rayon backing produces tiny pores in the polyethylene film possibly due to the attendant disruption of the film at its melting point forming small voids.

An adhesive 16 is placed on the fiber backing to bond the mat layer 12 to the absorbent layer 14 primarily because of the stresses encountered between the horse and the pad, especially in hard riding. The absorbent element might separate from the cushion portion of the laminate unless adhesively secured thereto. Preferably, the adhesive provides enough strength to hold the two layers together under normal stress when in use but yet allows the layers to be readily peeled apart by the user for replacement. Examples of adhesives which may be used for purposes of the present invention, in addition to acrylate adhesives, are urethane, vulcanized rubber and the like, although, as noted, acrylate adhesives are preferred.

In the preferred embodiment, the adhesive is coated on a release liner and the exposed adhesive is then adhered to the fibrous side of the absorbent layer. The release liner may then be removed when desired for bonding of the absorbent layer to the cushion layer. Thus, extra absorbent layers, the adhesive protected be a liner, may be stored for use when replacement of a soiled absorbent layer is desired. When the used absorbent layer needs to be replaced, it is simply peeled away from the cussion mat and the new absorbent layer is bonded to the mat. The mat may be washed before the new absorbent layer is applied.

The cushion laminate of the present invention dramatically aids in the accumulation of large amounts of moisture or other secretions by means of the absorbent layer and provides resiliency and loft by means of the cushion layer. By isolating the cushion and absorbing functions as described herein, a superior composite product is provided. The cushion portion of the laminate is non-matting, highly porous and washable, which are features not found in existing blankets or pads. Another important feature is that the cushion and absorbing materials function together without interfering with each other. As a result, the cushion laminate of the present invention provides for comfort and safety for horses which was heretofore unknown.

Example 1

Preparation of cushioning mat

Mats are prepared by extruding under pressure of about 500 psi (35 kg/sq. M) polyvinyl chloride resin having a specific gravity of 1.27, through an 18 inch (48 cm.) long spinneret having 572—0.020 inch (0.05 cm.) diameter holes arranged in four equal rows spaced 0.020 inch (0.05 cm.) apart. The spinneret was heated to about 300°F. (155°C.) and positioned 9 inches (23 cm.) above the surface of a 26 inch (66 cm.) wide, 36 inch (91 cm.) long, and 8-1/2 inch (21.5 cm.) deep water quench bath being flushed with 60—70°F. (16—21°C.) water at the rate of 1.2 gallons (3.9 liters) per minute. Dioctyl sodium sulfonsuccinate wetting agent was pumped into the quench tank at a rate sufficient to maintain a 0.5% concentration thereof in the quench solution. A 4 inch (10 cm.) diameter, 22 inch (56 cm.) long spiked row, having 0.073 inch (0.18 cm.) diameter, 1/8 inch (0.32 cm.) high cylindrical spikes spaced 1 inch (2.5 cm.) apart arranged in longitudinal rows with 1 inch (2.5 cm.) between rows and with the spikes in adjacent rows staggered 1/2 inch (1.25 cm), was positioned in the bath with its axis at the liquid level, and was driven at a surface speed of 10 feet (3 meters) per minute.

Polymer was extruded at the rate of 260 pounds (118 kg.) per hour, producing filaments from each hole at the rate of 3.7 lineal yards (3.3 meters) per minute, forming a bundle of filaments consisting of 4 parallel rows. Two five thousand watt quartz infrared lamps extending the length of the rows facing opposite major surfaces of the filament bundle and positioned about two inches (5.0 cm.) therefrom, were used to provide additional heat to attennuate the filaments.

The eetrusion die was first positioned with respect to the spiked row so that all the rows of filament contacted the row surface prior to being quenched, thus producing a mat. The alignment of the filament bundle was thereafter changed to permit some or all of the rows of filament to fall directly into the quench bath and the remaining rows to fall first upon the surface row to produce additional mats.

Example 2

Preparation of Saddle Pad

A mat or cushion was prepared according to Example 1 and an absorbent sheet was prepared essentially as heretofore described. The two layers were removably bonded together with an adhesive comprising a copolymer of isooctylacrylate and arylic acid. The newly formed laminate was cut to 30×30 inch (76×76 cm.) size and thereafter used in place of a normal fabric saddle blanket. After repeated use, the pad of this invention was observed to be superior to the fabric saddle blanket in several respects. The saddle pad of the present invention essentially eliminated the formation of sores or fungus growths on the horse. Further, no matting of horse hair was observed under the pad. The pad remained flexible and resilient after use and was dried out rapidly.

WHAT WE CLAIM IS:—

1. A flexible, resilient, absorbent cushion laminate comprising a generally flat sheet of a flexible, resilient cushion material bonded to a generally flat sheet of an absorbent material, capable of absorbing moisture or other secretions, comprising a fibrous backing material surfaced with self-sustaining, porous, thermoplastic film facing, the porosity of the facing being provided by a plurality of holes through the facing, the fibrous backing having fibres thereof embedded in the facing substantially throughout the area of contact of the backing and the facing thus uniting the backing and facing to one another and the cushioning material being bonded to the fibrous backing portion of the sheet of absorbent material.

2. A cushion laminate according to claim 1 comprising as the cushioning material a generally non-absorbent, flat mat of interengaged, crinkled filaments of a resilient thermoplastic polymeric material united together at points of mutual contact to form a flexible, resilient integrated structure the inner portion of which has been treated to form a flattened surface and to produce a higher concentration of filaments than in the outer portion of said mat, the fibrous backing being adhesively bonded to the flattened surface of the mat.

3. A cushion laminate according to claim 1 or claim 2 wherein the facing comprises a self-sustaining film having substantially 10 to 40 pores per square millimeter of film surface, each pore having an average area of no more than substantially 0.01 square millimeter and constituting substantially 10% to substantially 40% of the total area of the facing.

4. A cushion laminate according to claim 2 or claim 3 wherein the mat is made of plasticized polyvinylchloride.

5. A cushion laminate according to any preceding claim wherein the facing is polyethylene and the absorbent backing is cellulose.

6. A cushion laminate according to any of claims 2 to 5 wherein the filaments have a diameter substantially between 5 and 125 mils.

7. A cushion laminate according to any of claims 2 to 6 wherein the thickness of said mat is substantially 1/2 inch (1.25 cm.).

8. A cushion laminate according to any preceding claim wherein the thickness of the absorbent material is substantially 1/8 inch (0.32 cm.).

9. A cushion laminate according to any of claims 2—8 wherein the adhesive employed is an acrylate adhesive which bonds the non-absorbent sheet to the absorbent sheet.

10. A cushion laminate substantially as herein described with reference to the accompanying drawings.

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1347797 COMPLETE SPECIFICATION
1 SHEET

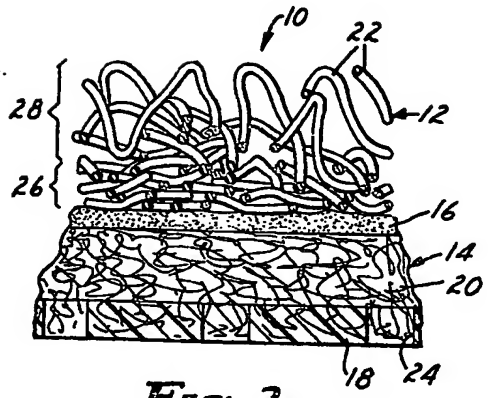

FIG. 3

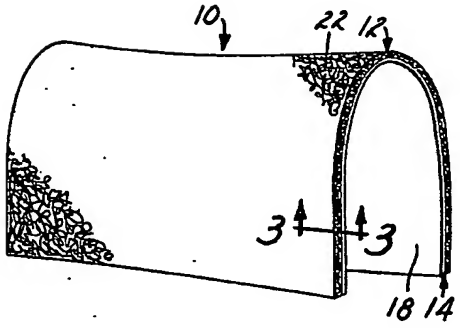

FIG. 1

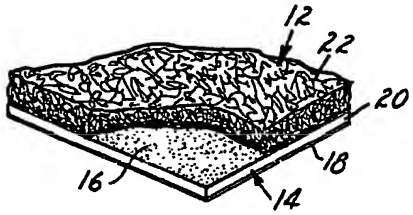

FIG. 2